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Reliable, Low-Cost, Low-Weight, Non-Hermetic Coatings for MCM Applications

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ABSTRACT

Through an Air Force Research Laboratory sponsored STTR program, Reliable, low-cost, low-weight, non-hermetic coatings for multi-chip-module(MCM) applications were developed. Using the combination of Sandia Laboratory ATC-01 test chips, AvanTeco's moisture sensor chips(MSC's), and silicon slices, we have shown that organic and organic/inorganic overcoatings are reliable and practical non-hermetic moisture and oxidation barriers. The use of the MSC and unpassivated ATC-01 test chips provided rapid test results and comparison of moisture barrier quality of the overcoatings. The organic coatings studied were Parylene and Cyclotene. The inorganic coatings were Al_2O_3 and SiO_2.

The choice of coating(s) is dependent on the environment that the device(s) will be exposed to. We have defined four(4) classes of environments: Class I(moderate temperature/moderate humidity). Class II(high temperature/moderate humidity). Class III(moderate temperature/high humidity). Class IV(high temperature/high humidity). By subjecting the components to adhesion, FTIR, temperature-humidity(TH), pressure cooker(PCT), and electrical tests, we have determined that it is possible to reduce failures 50-70% for organic/inorganic coated components compared to organic coated components.

All materials and equipment used are readily available commercially or are standard in most semiconductor fabrication lines. It is estimated that production cost for the developed technology would range from $1-10/module, compared to $20-200 for hermetically sealed packages.